# PLASTIC QUICK-SNAP CENTERBEARING ISOLATOR MOUNT AND METHOD OF MANUFACTURING AND ASSEMBLING SAME

## Background of the Invention

[0001] This application claims priority from U.S. provisional application Serial Number 60/484,740, filed 03 July, 2003, the details of which are incorporated herein by reference.

[0002] This invention relates to a vibration isolator or resilient mounting, and more particularly to a center bearing isolator mount assembly for damping vibrations, for example, in a motor vehicle, as well as a method of manufacturing and assembling same.

[0003] Resilient mountings or bushings generally include an outer rigid member or outer bracket formed with an aperture that receives an inner sleeve or rigid member, and a resilient, vibration damping material such as an elastomer or rubber between the outer bracket and inner sleeve. For example, it is common in the industry to form a resilient mounting of this type, often referred to as a center bearing isolator mount, by stamping an outer metal (steel) bracket in two or more separate metal stamping operations. Outer bracket components or support flanges are then welded to the bracket. An inner metal sleeve or ring is usually formed in a stamping operation. The isolator, i.e., rubber/elastomer, is mold bonded to the outer bracket and inner sleeve. Alternatively, the isolator is mold bonded to the inner sleeve and press fit into the outer bracket.

[0004] One drawback associated with the current industry standard is that a large force is required to press fit the inner sleeve with the mold bonded isolator into the outer bracket. There is also a concern with the potential that the mold bonded isolator/inner sleeve may separate or axially move relative to the outer bracket. Moreover, known isolator mount assemblies have significant weight, and a need also exists to improve the overall cost to manufacture and assemble.

[0005] Representative patents generally directed to resilient support or shaft bearings, which include vibration isolators, resilient mounts, and center bearing supports are U.S. Patent Nos. 2,939,748-Leach; 3,639,015-Maas;

3,743,059-Morse, et al.; 3,961,829-Bowen, et al.; 4,083,580-Shaner; 4,722,618-Matsumoto, et al.; 5,033,875-Moulinet; and 5,501,531-Hamaekers.

[0006] Accordingly, a need exists for an improved vibration isolator and method of manufacture/assembly that meets or exceeds the performance characteristics of known arrangements, and overcomes various problems of the prior art and methods of manufacture/assembly in a simple, economical way, and in a manner that is easy to manufacture.

**Summary of the Invention**

[0007] An improved resilient mounting or centerbearing isolator mount is provided that incorporates an insert that facilitates attachment of a molded rubber/elastomer isolator to an outer bracket.

[0008] More particularly, a resilient mount assembly includes a rigid, outer bracket having an opening that receives a rigid, inner mount therein. A resilient member or isolator is interposed between the inner mount and the outer bracket for damping vibrations. An insert is fixedly secured to one of the outer bracket and the inner mount, and includes a resilient snap member for selectively securing to the other of the outer bracket and inner mount.

[0009] The insert preferably includes plural circumferentially spaced fingers that deflect radially to snap-fit the outer bracket and inner mount together.

[0010] In the preferred embodiment, the fingers include locking tabs that preclude separation of the outer bracket and inner mount once assembled.

[0011] The elastomeric isolator member is desirably molded to the inner sleeve, and the insert is molded to the isolator member.

[0012] A method of manufacturing a preferred vibration isolator assembly includes the steps of providing an outer bracket, mold bonding an inner sleeve and elastomeric isolator together, providing an insert, and inserting the bonded sleeve isolator, and insert into the outer bracket.

[0013] Preferably, the mold bonding step includes the step of mold bonding the inner sleeve, elastomeric isolator, and insert together.

[0014] A primary benefit of the invention resides in the increased manufacturing throughput by removing the existing large outer bracket from the rubber/elastomer mold and replacing it with a smaller molded plastic component, i.e., increased number of cavities in the mold.

[0015] Another advantage is associated with the reduced force required to assemble the mold bonded isolator/inner sleeve subassembly to the outer bracket.

[0016] Yet another advantage results from eliminating galvanic corrosion between selected components of the vibration isolator assembly.

[0017] Still other features and benefits of the invention will become apparent to those skilled in the art upon reading and understanding the following detailed description.

**Brief Description of the Drawings**

[0018] Figure 1 is a perspective view of a propshaft assembly incorporating center bearing isolator mount assemblies of the present invention.

[0019] Figure 2 is a perspective view of a top mounted center bearing isolator mount assembly.

[0020] Figure 3 is an elevational view of the assembled components of Figure 2.

[0021] Figure 4 is a perspective view of a hanger mounted center bearing isolator mount assembly.

[0022] Figure 5 is an elevational view of the assembled components of Figure 4.

[0023] Figure 6 is an elevational view of the molded center bearing subassembly.

[0024] Figure 7 is a cross-sectional view generally along the lines 7-7 of Figure 6.

[0025] Figure 8 is an enlarged detail view of the encircled portion of Figure 7.

[0026] Figure 9 is an enlarged detail view of the encircled portion of Figure 6.

[0027] Figures 10 and 11 are elevational and cross-sectional views of the insert, respectively.

[0028] Figures 12 and 13 are perspective views of the disassembled and assembled components.

[0029] Figure 14 is a top plan view of the assembled centerbearing isolator mount assembly.

**Detailed Description of the Invention**

[0030] Turning first to Figure 1, a rotary shaft such as a propshaft **20** is shown and includes three distinct portions, namely, front propshaft **22**, a mid propshaft **24**, and a rear propshaft **26**. These portions are assembled together in a known manner to transmit rotary force from one end to the other in a manner well known in the art, the details of which are not provided herein nor necessary to a full and complete understanding of the present invention. As will be appreciated, however, the mid propshaft portion is supported adjacent opposite ends thereof by resilient mountings or bushings, more specifically referred to as center bearing isolator mount assemblies **30**. As illustrated in Figure 1, each of the bearing isolator mount assemblies is identical to the other, although variations are envisioned, some of which are described in greater detail below.

[0031] With continued reference to Figure 1, and additional reference to Figures 2 and 3, the bearing isolator mount assembly includes a rigid first member or outer bracket **32**. The outer bracket has an aperture or opening **34** extending axially therethrough. In this embodiment, the outer bracket is a generally hollow, cylindrical configuration or annulus having support members **36, 38** extending outwardly therefrom for securing the outer bracket to an associated frame of a motor vehicle (not shown). Again, the particular details of the mounting arrangement are generally known in the art. The bracket flanges **36, 38** are shown as extending outwardly in a symmetrical manner in Figure 3, however, other configurations can also be used without departing from the scope and intent of the present invention. For example, as illustrated in Figures 3 and 4, like numerals with a primed suffix (') identify like elements and non-symmetrical flanges **36', 38'** extend outwardly from the bracket.

[0032] It is preferable that the outer bracket be formed of a rigid material such as a metal. In a preferred arrangement, the metal is aluminum which is extruded into the desired conformation of the bracket. The preferred arrangement, though, should not limit the invention since it is understood that other stamped, cast, or other materials or construction may be used. The flange portions **36, 38** also preferably include openings **40** that receive a fastener (not shown) for securing the outer bracket to the associated vehicle. The aperture **34** is preferably centered in the outer bracket and dimensioned to receive a sub-assembly **50**.

[0033] The sub-assembly **50** (Figures 6-9) includes a rigid member or inner sleeve **52**, which is generally annularly shaped and includes an opening **54** therethrough dimensioned for bearing receipt over the mid propshaft. As is generally known in the art, a resilient material such as an elastomer or rubber **60** is provided between the inner sleeve and the outer bracket. Preferably, the rubber is mold bonded to an outer perimeter of the inner sleeve. As best illustrated in Figures 7 and 8, the elastomer extends over substantially the entire length of the inner sleeve and includes an intermediate section **62** that extends axially outward from the inner sleeve as it proceeds radially outward. This configuration is generally known in the art. Likewise, circumferential portions **64** have generally radially outward extending serrated portion **66** (Figure 9). Again, in a manner generally known in the art the serrated portions provide good flexibility and clearance therearound during normal static loading. If an increased static or dynamic load is encountered, the radial spring rate of the elastomeric material is increased when serrated portion is radially compressed and increases the radial stiffness of the assembly.

[0034] Also received in the annular space between the inner sleeve and the outer bracket is an insert **70**. In the preferred arrangement, the insert is formed of a polymer or plastic material. In addition to being shown in Figures 6-8, the insert is also individually illustrated in Figures 10 and 11. The insert has an axial length slightly greater than that of the inner sleeve and an inner opening **72** dimensioned to define an annular space with the outer wall of the inner sleeve. The polymer construction, such as a glass reinforced

fiber incorporated in a nylon, is molded to the elastomeric isolator in a preferred embodiment. In this manner, the inner sleeve, isolator, and insert are joined together to form the sub-assembly **50**. The insert includes a continuous shoulder **74** at one end and circumferentially spaced fingers **76** (Figure 12) having locking tabs **78** that extend radially outward therefrom at the other end. The insert further includes an axially extending key **80** that cooperates with a recess or key way **82** (Figures 2-5) that rotationally aligns the sub-assembly **50** in the proper circumferential orientation relative to the outer bracket. This facilitates assembly during axial insertion of the sub-asembly into the opening **34** of the outer bracket.

[0035] As illustrated in Figures 12-14, upon axial insertion of the sub-assembly into the outer bracket, the fingers **76** deflect radially inward under the imposed axial force. The locking tabs then flex radially outward once received through the outer bracket opening and snap-fit radially outward to axially engage the opposite face of the outer bracket. Likewise, shoulder **74** abuts against the opposite face of the outer bracket. In this manner, the plastic insert provides a quick-snap or snap-to-fit assembly of the inner sleeve, rubber isolator, and insert sub-assembly **50** into the outer bracket. The cooperation of locking tab **78** on one face of the outer bracket and the radial shoulder **74** on the opposite face of the outer bracket also prevents relative axial movement or "walk-out" of the sub-assembly relative to the outer bracket.

[0036] By manufacturing the insert from plastic, galvanic corrosion is also prevented between the components. The inner steel insert is isolated from the outer extruded aluminum bracket and the mold bond rubber/elastomer effectively dampens vibrations and prevents the vibrational forces from being transferred from the inner sleeve to the outer bracket. A substantially smaller installation force is required for inserting the sub-assembly into the outer bracket. This new arrangement also substantially reduces the weigh and cost over the existing centerbearing isolator mount assemblies.

[0037] Although the invention has been described relative to a center bearing isolator mount assembly, it will be appreciated that its features may

be applied to other vibration control products that require an attachment feature between a bracket or sleeve to molded rubber/elastomer. Likewise, where a positive stop is required to prevent relative axial movement between these components, it is clear that this feature may be useful in such an environment.

[0038] It will also be appreciated that by removing the larger outer bracket from the rubber/elastomer mold, and replacing it with a smaller molded plastic component (insert), that an increased number of cavities may be provided in the rubber mold. This increases manufacturing throughput. In addition, the reduced force required to assemble the sub-assembly into the outer bracket is substantially less than the current industry standard of press fitting the inner sleeve and isolator into an outer bracket. Although plastic is preferred as the insert material, it will be further appreciated that still other materials can be used without departing from the scope of the present invention.

[0001] The invention has been described with reference to the preferred embodiment. Modifications and alterations will occur to others upon reading and understanding this specification. It is intended to include all such modifications and alterations in so far as they come within the scope of the appended claims or the equivalents thereof